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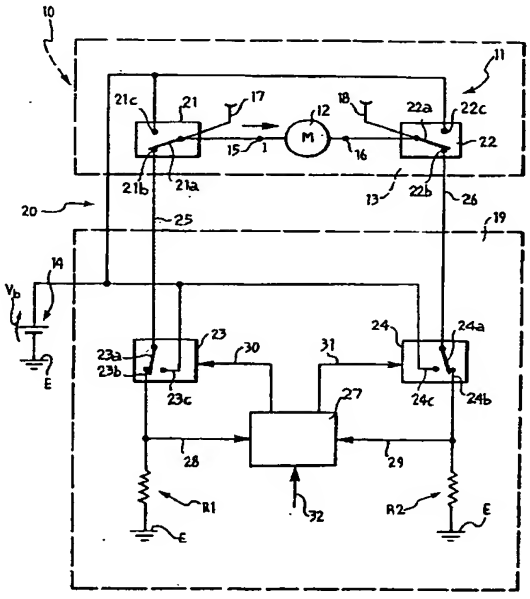
(54) A control device for an electrical window regulator for motor vehicles

(57) In order to control an electrical window regulator (11), the device (10; 40) comprises two electrical push-button switches (21, 22; 49, 50) for controlling the raising and the lowering of the window, and a control circuit (19; 36; 46) connected to those switches (21, 22; 49, 50) and designed to control the supply of current to the motor (12; 43) in accordance with predetermined methods. Each switch (21, 22; 49, 50) has a main terminal (21a, 22a; 49a, 50a) which is connected to the electric motor (12, 43) and which is connectable selectively to a first terminal (21c, 22c, 49c, 50c) connected to one pole (+) of the voltage source (14) and, respectively, to a second terminal (21b, 22b; 49b, 50b) in the actuated state and, respectively, in the resting state of the switch (21, 22; 49, 50). The control circuit comprises two controlled switches (23, 24; 54, 55) which are associated with the push-button switches (21, 49; 22, 50) and each of which has a main terminal (23a, 24a; 54a, 55a) which is connected to the second terminal (21b, 49b; 22b, 50b) of the associated push-button switch (21, 49; 22, 50) and which is connectable selectively to one pole (+) and, respectively, to the other pole (-) of the voltage source (14) in an energised state and, respectively, in the de-energised state of the controlled switch (23, 24; 54, 55). Sensor devices (R1, R2; R; R3, R4) detect the passage of current into the motor (12; 43). After the passage of current into the motor (12; 43) owing to the operation of a push-button switch (21, 22; 49, 50), a control circuit (27; 37; 56), which is connected to the sensor devices (R1, R2; R; R3, R4), energises the controlled switch (24, 23; 55, 54) associated with the other push-button switch (22, 21; 50, 49) so that the motor (12) remains connected to the two poles (+, -) of the voltage source (14) even after the operated push-button switch (21, 22; 49, 50) has been released.

FIG. 1



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Description

The present invention relates to a control device for an electrical window regulator for motor vehicles, of the type defined in the precharacterising clause of appended Claim 1.

In control devices for pulse-driven window regulators, the control push-buttons, which can be operated manually by the user, have the exclusive function of providing control signals for starting the rising or descending movement of the window. The drive of the associated electric motor for raising or lowering the window is controlled by means of a plurality of power relays which are selectively energised/de-energised in accordance with and as a function of the command given.

These known devices require rather complicated and extensive connections and wiring, which are a burden from the point of view of production and set-up, and also from the point of view of cost.

The aim of the invention is to produce a control device for an electrical window regulator of a motor vehicle, which requires simpler connections and wiring and which is therefore more advantageous also from the point of view of production and set-up, as well as from the point of view of economy.

This aim is achieved according to the invention using a control device of which the principal characteristics are defined in appended Claim 1.

Other characteristics and advantages of the invention will become clear from the following detailed description, which is given purely by way of non-limiting example, with reference to the appended drawings, in which:

- Figure 1 is a general diagram of a control device for a window regulator according to the invention;
- Figure 2 is a diagram of a variant of embodiment of the device according to Figure 1; and
- Figure 3 is a diagram of another embodiment of a device according to the invention.

With reference to Figure 1, a control device indicated 10 is applied to an electrical window regulator 11 of a motor vehicle, which regulator comprises an electric motor 12 and a mechanism for transmitting motion which can be driven by the motor 12 and which is of known type, not shown .

In the configuration shown in Figure 1, the window regulator 11 is mounted on a door 13 of the motor vehicle which is adjacent to the driver's seat ("driver's side").

The motor 12 is of the direct current type and has two terminals 15 and 16. Its rotor can be rotated in two senses in accordance with the direction of the current supplied to the motor.

By means of the motion-transmitting kinematics, the rotation of the motor induced by a current I in the sense of the arrow of Figure 1 causes the window (for example) to be raised, while a flow of current into the motor in the opposite sense causes the window to be lowered.

The control device 10 in Figure 1 comprises a pair of push-buttons 17 and 18 for controlling the raising and lowering, respectively, of the window, and a control unit 19.

The unit 19 is mounted in the body of the motor vehicle, while the push-buttons 17 and 18 are mounted, for example, on the door 13 on the driver's side and are connected to the unit 19 by means of connections 25 and 26.

The push-buttons 17 and 18 act on two respective switches 21 and 22 which are pulse-controlled and (for example) have spring return. Each switch has a mobile contact 21a, 22a and two fixed contacts 21b, 21c and 22b, 22c.

The mobile contacts 21a and 22a are normally closed on the fixed contacts 21b and 22b, respectively, as shown in Figure 1.

The mobile contacts 21a, 22a are connected to the terminals 15 and 16 of the motor 12, while the contacts 21b, 22b are connected to the unit 19, and the contacts 21c, 22c are connected to the positive pole of the battery 14 by way of a conductor 20.

The unit 19 comprises two switching relays 23 and 24 and a control circuit 27.

Each of the relays 23 and 24 has a mobile contact 23a, 24a and two fixed contacts 23b, 23c and 24b, 24c.

The mobile contacts 23a, 24a are normally closed on the fixed contacts 23b and 24b, respectively.

The mobile contacts of the relays 23 and 24 are connected, respectively, to the fixed contacts 21b and 22b of the switches 21 and 22, by way of the conductors 25 and 26.

The fixed contacts 23c and 24c of the two relays 23 and 24 are connected to the positive pole of the battery 14, while the contacts 23b and 24b are connected to earth E by way of shunt resistors R1 and R2.

At rest, the terminals 15 and 16 of the motor 12 are connected to earth by way of the resistors R1 and R2, the mobile contacts 21a, 22a and the fixed contacts 21b, 22b of the switches 21 and 22, the conductors 25 and 26 and the contacts 23a, 23b and 24a, 24b of the relays 23 and 24.

The control circuit 27 has two inputs 28 and 29 which are connected to the resistors R1 and R2, and two outputs 30 and 31 which control the relays 23 and 24. A further input line 32 is optionally also provided.

The circuit 27 controls the relays 23 and 24 in such a manner as to supply the motor 12 in conformity with the commands imparted by means of the push-button 17 or 18, or by means of the line 32.

After a window-raising or window-lowering cycle has started, the circuit 27 can interrupt the supply to the motor after a new command given by means of the push-button 17 or 18 or as a result of the attainment of a stop position in the rising or descending movement of the window, as will be described in more detail hereinaf-

ter.

To that end, the circuit 27 is designed to detect the voltages at its input 28 or 29, which indicate the current flowing into the motor 12 and its sense of flow.

The control circuit 27 is also designed to drive the switching of the relay 24 and the relay 23, respectively, after the detection of a voltage at its input 28 or 29.

The circuit 27 is also designed to detect a loss of voltage at its input 28 or 29, which indicates an interruption in the current I into the motor 12, and, as a consequence, to carry out a particular stopping sequence or procedure of the motor.

This stopping sequence provides for the initial energisation of both relays 23 and 24 and their subsequent de-energisation after a predefined period of stabilisation. This brings about the definite interruption of the supply of current to the motor even if one of the push-buttons 17 or 18 has been maintained activated temporarily after the motor has been stopped.

The circuit 27 is also designed to detect overvoltages at its inputs 28 and 29, which indicate that the motor 12 is overloaded, in order to start the stopping sequence in a manner analogous to that provided for when a loss of voltage is detected.

With reference to the resting state of the system shown in Figure 1, the operation of one of the two push-buttons 17 or 18 causes the motor 12 to be started in the sense corresponding to the raising or, respectively, lowering of the window.

The movement of the window can be interrupted by means of a subsequent pulsed operation of the other push-button 18 or 17, or after the circuit 27 has detected that a stop position has been reached.

In particular, the operation of the push-button 17 which controls the raising of the window brings about the connection of the terminal 15 of the motor 12 to the positive pole of the battery 14, with a consequent flow of current I in the sense of the arrow of Figure 1, by way of the contacts 21a, 21c of the switch 21, the contacts 22a and 22b of the switch 22, the conductor 26, the relay 24 and the resistor R2.

In this state, the circuit 27 detects the voltage appearing at its input 29 and provides an energising command at its output 30. The relay 23 switches over and its mobile contact 23a closes on the fixed contact 23c which is connected to the battery 14.

The contact 21b of the switch 21 is thus connected to the battery 14 by way of the conductor 25 and the relay 23.

In this situation, the release of the push-button 17 has no effect on the motor 12 because the contact 21a of the switch 21 closes again on the contact 21b which has been connected to the positive pole of the battery by way of the relay 23.

The terminal 15 of the motor 12 remains connected to the battery, and a current I continues to flow into the motor in the sense of the arrow, and towards earth via the contacts 22a and 22b of the switch 22, the relay 24. and the resistor R2.

The motor increases to its normal speed and causes the window to be raised continuously.

In order to stop the raising of the window, it is necessary to operate the lowering push-button 18. This causes the switching of the contact 22a of the switch 22 towards the fixed contact 22c, and the temporary connection of the terminal 16 to the positive pole of the battery 14 and thus the interruption of the flow of current into the motor. The circuit 27 detects the loss of voltage at the resistor R2 and starts the stopping sequence. This circuit, in addition to maintaining the energisation of the relay 23, now also energises the relay 24 by moving the mobile contact 24a onto the fixed contact 24c which is connected to the positive pole of the battery. The terminals 15 and 16 of the motor are now both connected to the positive pole of the battery, and the motor stops, irrespective of the position of the push-buttons 17 and 18.

After the period of stabilisation provided for by the stopping sequence, the circuit 17 finally de-energises both relays 23 and 24, reconnecting the terminals 15 and 16 of the motor to earth (resting state).

If in the course of raising the window the user does not operate the button 18, the window continues to rise until it reaches the upper stop position. An overload current then passes through the motor 12 as a result of the stopping of the rotor thereof. The circuit 27 detects the state of overvoltage at the resistor R2 and starts the stopping sequence described above, finally restoring the resting states of the various components.

The controlled lowering and stopping of the window are effected in a manner exactly symmetrical to that described above, in response to an initial operation of the lowering push-button 18 and to the subsequent operation of the raising push-button 17 or to reaching the lower stop position.

In detail, the depression of the push-button 18 causes the terminal 16 to be connected to the positive pole of the battery by way of the contacts 22a and 22c of the switch 22, with a consequent flow of current into the motor 12 in the opposite sense to that of the arrow in Figure 1, this current flowing towards earth by way of the contacts 21a, 21b of the switch 21, the conductor 25, the relay 23 and the resistor R1.

The circuit 27 responds to the voltage which appears at its input 28 by energising the relay 24, the mobile contact 24a of which closes on the contact 24c, thus becoming connected to the positive pole of the battery.

When the push-button 18 is subsequently released, the mobile contact 22a of the switch 22 returns to the fixed contact 22b and the terminal 16 is connected to earth by way of the conductor 26 and the relay 24. The current continues to flow into the motor 12 in the opposite direction to that of the arrow in Figure 1. The window is therefore lowered in a continuous manner.

The operation of the raising push-button 17 during the lowering of the window interrupts the passage of current into the motor and into the resistor R1. The cir-

cuit 27 then starts the stopping sequence described above, returning the entire device to the resting state.

The circuit also monitors the voltage at the resistor R1 during the lowering of the window and starts the stopping sequence if it detects an overvoltage, which indicates the stopped state of the motor 12 when the window reaches the lower stop position.

The circuit 27 is also designed to control the raising of the window as far as the upper stop position in response to a signal applied to its input 32. In that case, the circuit 27 energises the relay 23, causing the window to be raised continuously until it reaches the stop position.

The input 32 of the circuit 27 may receive a control signal as a result of the activation of a system for locking the doors of a motor vehicle, which signal is emitted, for example, by means of a remote control device in a manner known per se.

The control device 35 illustrated in Figure 2 differs from the device 10 described above in respect of the control unit, which is now indicated 36.

The control unit 36 comprises the same relays 23 and 24, which are connected in the same way to the switches 21 and 22.

The unit 36 has, however, a different control circuit, indicated 37, and a single shunt resistor R.

One terminal of the resistor R is connected to earth and the other terminal is connected to the contacts 23b and 24b of the relays 23 and 24. The control circuit 37 has, correspondingly, a single input for testing the voltage across the resistor R.

Both the operation of the push-button 17 and the operation of the push-button 18 cause a current to pass into the resistor R in the same direction.

The circuit 37 is designed to detect the voltage which appears at its input 38, but this voltage indicates only that a current is flowing into the motor 12 and the absolute value of that current, but not its sense of flow.

The circuit 37 is, however, advantageously designed to distinguish the sense of flow of the current into the motor by carrying out the following check in an initial testing stage.

If voltage is detected at the resistor R, the circuit 37 energises one of the relays 23, 24, for example the relay 23, and thus monitors the voltage at the resistor R.

If a voltage remains at this resistor, this indicates that the switching of the relay 23 has effected a connection consistent with the operation of the push-button 17, and therefore that the current is flowing into the motor in the sense to which the raising of the window corresponds. In that case, the circuit 37 de-energises the relay 23 and the current into the motor 12 continues to flow in the initial sense. The motor thus causes the window to be raised continuously.

If, however, after the switching of the relay 23, there is a loss of voltage at the resistor R, this indicates that the switching operation has brought about the interruption of the current into the motor.

The circuit 37 can thus detect that the current into the motor 12, before the energisation of the relay 23, flows in the sense corresponding to the lowering of the window. The circuit therefore proceeds to de-energise the relay 23 and to energise the relay 24. The motor is thus now supplied by way of the switch 21, the contacts 23a and 23b of the relay 23, the relay 22 and the contacts 24a, 24c of the relay 24. After the momentary interruption of the current during the brief energisation of the relay 23, the motor 12 can now restart and effect the lowering of the window.

The testing and checking stage described above can be carried out within a minimum time period of the order of a few milliseconds and therefore the user is not in practice aware of any discontinuity of operation.

In addition, the circuit 37 is designed to monitor the voltage at the resistor R and to start a stopping sequence if it detects overvoltage indicating that the motor 12 is overloaded. The stopping sequence is analogous to that described above in connection with the circuit 27 of Figure 1 and provides for the simultaneous energisation of the two relays 23 and 24, followed by de-energisation after a period of stabilisation.

Finally, the circuit 37 is also designed to provide for the raising of the window as far as the upper stop position in response to a signal applied to its input 32, by energising the relay 23 after the activation, for example, of a control system for locking the doors of the vehicle, imparted by means of (for example) a remote control device.

In the embodiment according to Figure 3, the control device, now indicated 40, is applied to an electrical window regulator 11 mounted on a door 42 on the side of the motor vehicle opposite the driver's side.

The device 40 comprises a first pair of push-buttons 44 and 45 mounted on the door 42, a second pair of push-buttons 47 and 48 mounted on the door 13 adjacent to the driver's seat, and a control unit 46.

The push-buttons 44 and 47 control the raising of the window, while the push-buttons 45 and 48 control the lowering thereof.

The push-buttons 44 and 45 operate switches 49 and 50 mounted on the door 42, while the push-buttons 47 and 48 operate switches 51 and 52 mounted on the door 13. These switches are of the pulsed type with spring return and are connected to one another and to the unit 46 in the manner illustrated.

The switches 49 to 52 are analogous to the switches 21 and 22 of the device 10 of Figure 1, and their contacts 49c-52c are also connected to the positive pole of the battery 14.

The motor 43 is connected to the mobile contacts of the switches 49 and 50, and the contacts 49b and 50b of the switches 49 and 50 are connected to the mobile contacts 51a and 52a of the switches 51 and 52.

The electronic unit 46 is substantially identical with the unit 19 of Figure 1 and comprises two switching relays 54 and 55 and a control circuit 56, analogous to the relays 23, 24 and to the circuit 27 of Figure 1.

The mobile contacts 54a and 55a of the relays 54

and 55 are connected to the contacts 51b and 52b, respectively, of the switches 51 and 52. The contacts 54c and 55c are connected to the positive pole of the battery 14, and the contacts 54b and 55b are connected to earth by way of shunt resistors R3 and R4.

The control circuit 56 is designed to detect the voltages at the resistors R3 and R4 applied to its inputs 57 and 58 and to cause the relays 54 and 55 to be switched by way of two output lines 59 and 60.

The circuit 56 also has a further input line 61, for external activation, for example as a result of a command given with a remote control device.

The possibility of controlling the window regulator 11 by means of the push-buttons 44 and 45 is governed by the state of the switches 51 and 52 and, analogously, the possibility of control by means of the push-buttons 47 and 48 is governed by the state of the switches 49 and 50.

When the governing switches are in the resting state, the push-buttons 44, 45, 47 and 48 are able to activate the unit 46 and the motor 43 in a manner analogous to that described above in connection with the operation of the device 10 of Figure 1.

For example, the operation of a push-button 44 or 47 controlling the raising of the window causes one terminal of the motor 43 to be connected to the positive pole of the battery by way of the path 49a, 49c of the switch 49 or by way of the path 51a, 51c of the switch 51, the paths 50a, 50b and 52a, 52b of the switches 50 and 52, the relays 54 and 55 and the shunt resistor R4.

The circuit 56 responds to the voltage which appears at its input 58 by sending a signal on the line 59 in order to energise the relay 54, the mobile contact 54a of which moves onto the contact 54c, thus becoming connected to the positive pole of the battery 14.

The subsequent release of the operated push-button 44 or 47 causes its mobile contact 49a or 50a to return to the fixed contact 49b or 50b; the connection of the motor 43 to the positive pole of the battery is maintained by means of the energised relay 54. The motor 43 is therefore supplied and causes the window to be raised.

The operation of the lowering push-button 45 or 48 in the course of the raising of the window causes the associated switch 50 or 52 to switch over and the motor to stop. The interruption of the current into the resistor R4 is detected by the circuit 56 which starts a stopping sequence for the motor 43, in a manner analogous to that described above.

The relay 55 is energised and therefore the two terminals of the motor 43 are both connected to the positive pole of the battery and, after a period of stabilisation, both relays are de-energised.

The operation of the device 40 of Figure 3 after the operation of the push-button 45 or 48 controlling the lowering of the window is analogous to that corresponding to the operation of the push-buttons 44 and 47, but with a current which flows into the motor 43 in the sense opposite to the previous sense, which causes the window to be lowered. In this case, initially, the circuit 56 responds to the voltage appearing at the resistor R3 and energises the relay 55 accordingly.

The lowering of the window is in this case stopped by operating a push-button 44 or 47 controlling the raising of the window.

The stopping of the motor 43 when the window reaches a stop position is effected, as in the case of the device according to Figure 1, as a result of the detection of an overvoltage at the resistor R3 or R4 and with the starting of a stopping sequence on the part of the circuit 56, analogous to the sequences described above.

The simultaneous operation of push-buttons having different actions (for example the push-buttons 44 and 45) does not have any effect because it prevents the completion of the starting sequence on the part of the control unit 46.

It will be appreciated that numerous variations and modifications can be made to the device according to the invention without thereby departing from the scope of the invention.

In the case of the device of Figure 3 also, the shunt resistors R3 and R4 may be replaced by a single resistor, as in the device of Figure 2.

Furthermore, the relays can be replaced by solid state switching devices.

It will also be appreciated that the control units 19, 36 and 46 can be produced in an integrated form in a single component.

Finally, it will be appreciated that the control units described above can be produced using suitably programmed microprocessor units.

Claims

1. A control device for an electrical window regulator (11) of a motor vehicle, which comprises a bidirectional electric motor (12; 43) for controlling the movement of the glass of a vehicle window; the control device (10; 40) comprising a first and a second electrical switch of the push-button type (21, 22; 49, 50) which can be operated to control the raising and, respectively, lowering of the window, and control circuit means (19; 36; 46) which can be connected to a direct current voltage source (14) of the motor vehicle and which are connected to the switches (21, 22; 49, 50); the control means (19, 36, 46) being designed to control the supply of current to the motor (12; 43) in accordance with predetermined methods as a function of the commands given by means of the push-button switches (21, 22; 49, 50);

   characterised in that each push-button switch (21, 22; 49, 50) has a main terminal (21a, 22a; 49a, 50a) which is connected to a terminal of the electric motor (12, 43) and which is connectable selectively to a first terminal (21c, 22c, 49c, 50c) connected to one pole (+) of the voltage source (14) and, respectively, to a second terminal (21b, 22b;

49b, 50b), in the actuated state and, respectively, in the resting state of the switch (21, 22; 49, 50);
and in that the control means comprise

a first and a second controlled switch (23, 24; 54, 55) which are associated with the first and, respectively, second push-button switch (21, 49; 22, 50) and each of which has a main terminal (23a, 24a; 54a, 55a) which is connected to the second terminal (21b, 49b; 22b, 50b) of the associated push-button switch (21, 49; 22, 50) and which is connectable selectively to the pole (+) and, respectively, to the other pole (-) of the voltage source (14) in an energised state and, respectively, in the de-energised state of the controlled switch (23, 24; 54, 55);
sensor means (R1, R2; R; R3, R4) which are capable of detecting the passage of current into the electric motor (12; 43); and
a control circuit (27; 37; 56) which is connected to the sensor means (R1, R2; R; R3, R4) and is capable, after the detection of a passage of current into the motor (12; 43) following the operation of a push-button switch (21, 22; 49, 50), of energising the controlled switch (24, 23; 55, 54) associated with the other push-button switch (22, 21; 50, 49) so that the electric motor (12) remains connected to the two poles (+, -) of the voltage source (14) even after the operated push-button switch (21, 22; 49, 50) has been released.

2. A device according to Claim 1, characterised in that it comprises a first and a second additional push-button switch (51, 52) for controlling the raising and, respectively, lowering of the window;
each additional push-button switch (51, 52) having a main terminal (51a, 52a) connected to the second terminal (49b, 50b) of the corresponding first or second push-button switch (49, 50), and a first and a second terminal (51c, 51b; 52c, 52b) connected to the pole (+) of the voltage source (14) and, respectively, to the main terminal (54a, 55a) of the associated controlled switch (54, 55); the main terminal (51a, 52a) of each additional push-button switch (51, 52) being connected selectively to the associated first and second terminal (51c, 51b; 42c, 52b) when the additional switch (51, 52) is in the actuated state and, respectively, in the resting state.

3. A device according to Claim 1 or 2, characterised in that each controlled switch (23, 24; 54, 55) has a first and a second terminal (54c, 54b; 55c, 55b) which are connected to the pole (+) and, respectively, to the other pole (-) of the voltage source (14) and which are selectively connectable to the associated main terminal (23a, 24a; 54a, 55a) in the energised state and, respectively, in the de-energised state of the controlled switch (23, 24; 54, 55); the sensor means comprising shunt resistor means (R1, R2; R; R3, R4) which are connected between the second terminals (23b, 24b; 54b, 55b) of the controlled switches (23, 24; 54, 55) and the other pole (-) of the voltage source (14).

4. A device according to Claim 3, characterised in that the shunt resistor means comprise a first and a second shunt resistor (R1, R2; R3, R4) which are connected between the second terminals (23b, 24b; 54b, 55b) of the first and, respectively, the second controlled switch (23, 24; 54, 55) and the other pole (-) of the voltage source (14).

5. A device according to Claim 3, characterised in that the shunt resistor means comprise a single resistor (R) connected between the second terminals (23b, 24b) of the controlled switches (23, 24) and the other pole (-) of the source (14).

6. A device according to Claim 5, characterised in that the control circuit (37) is designed to detect, after the operation of a push-button switch (21, 22), the passage of current into the motor (12) and to determine the sense of rotation of the motor (12) by energising selectively one of the controlled switches (23, 24).

FIG. 1

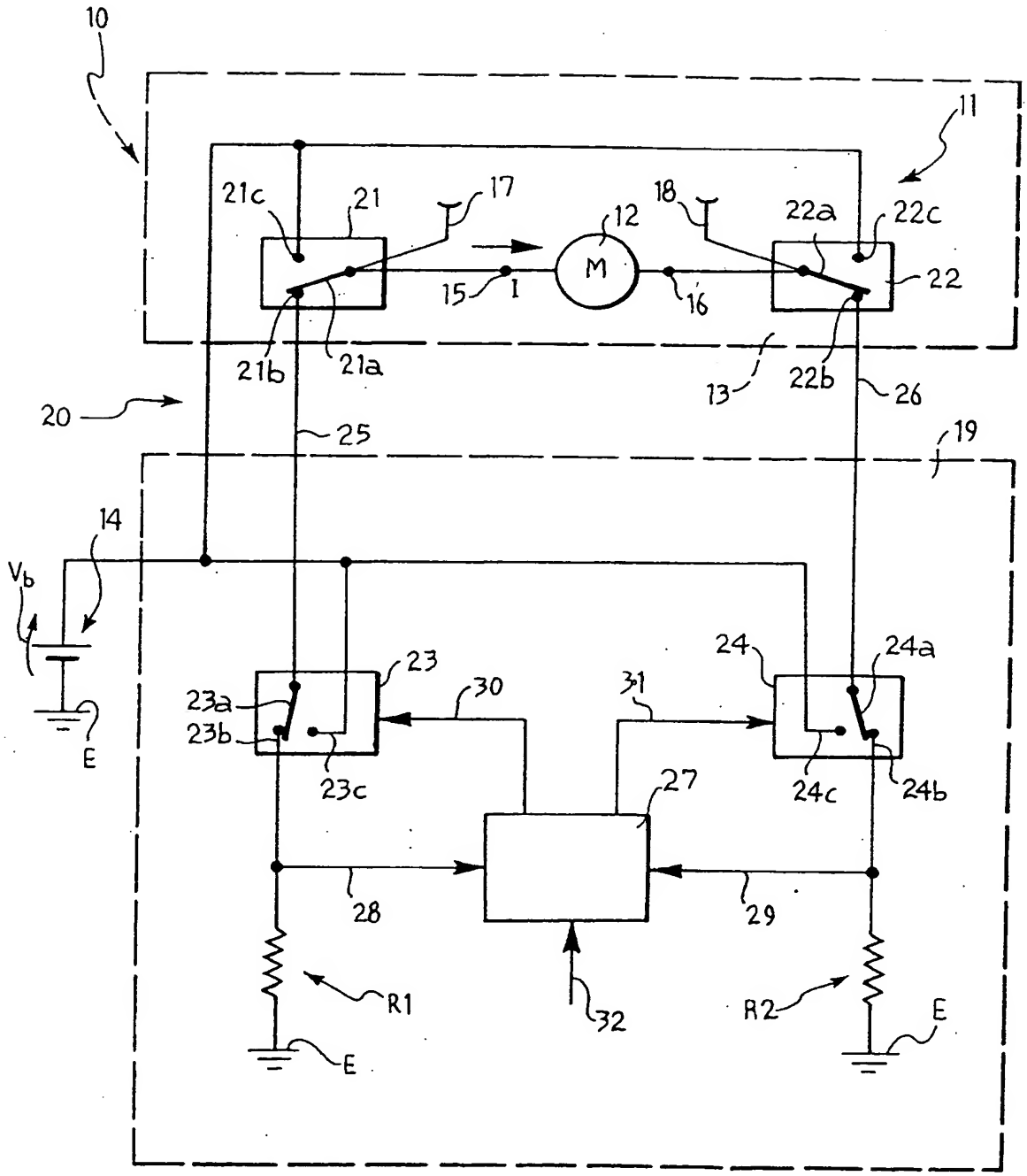


FIG. 2

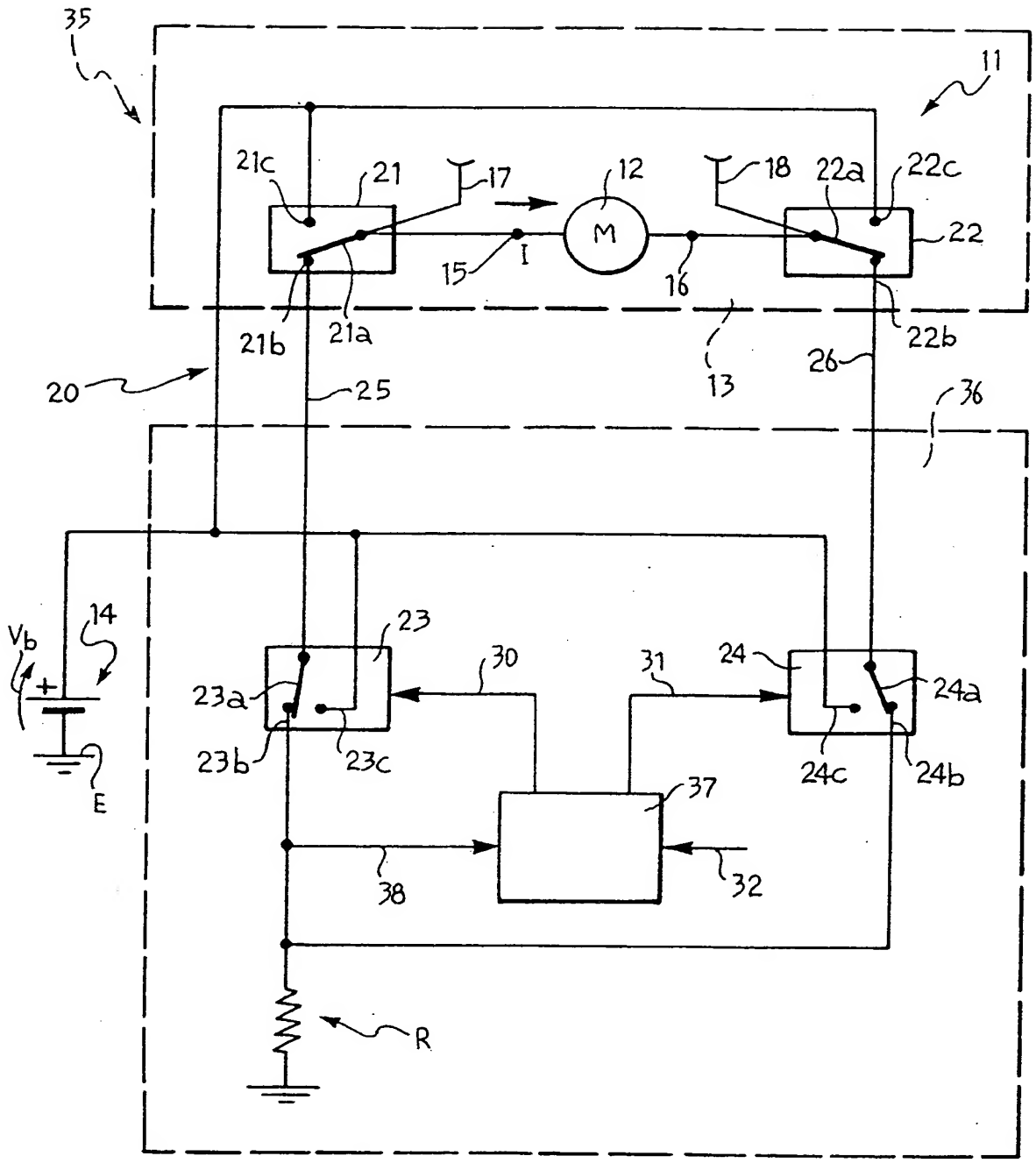
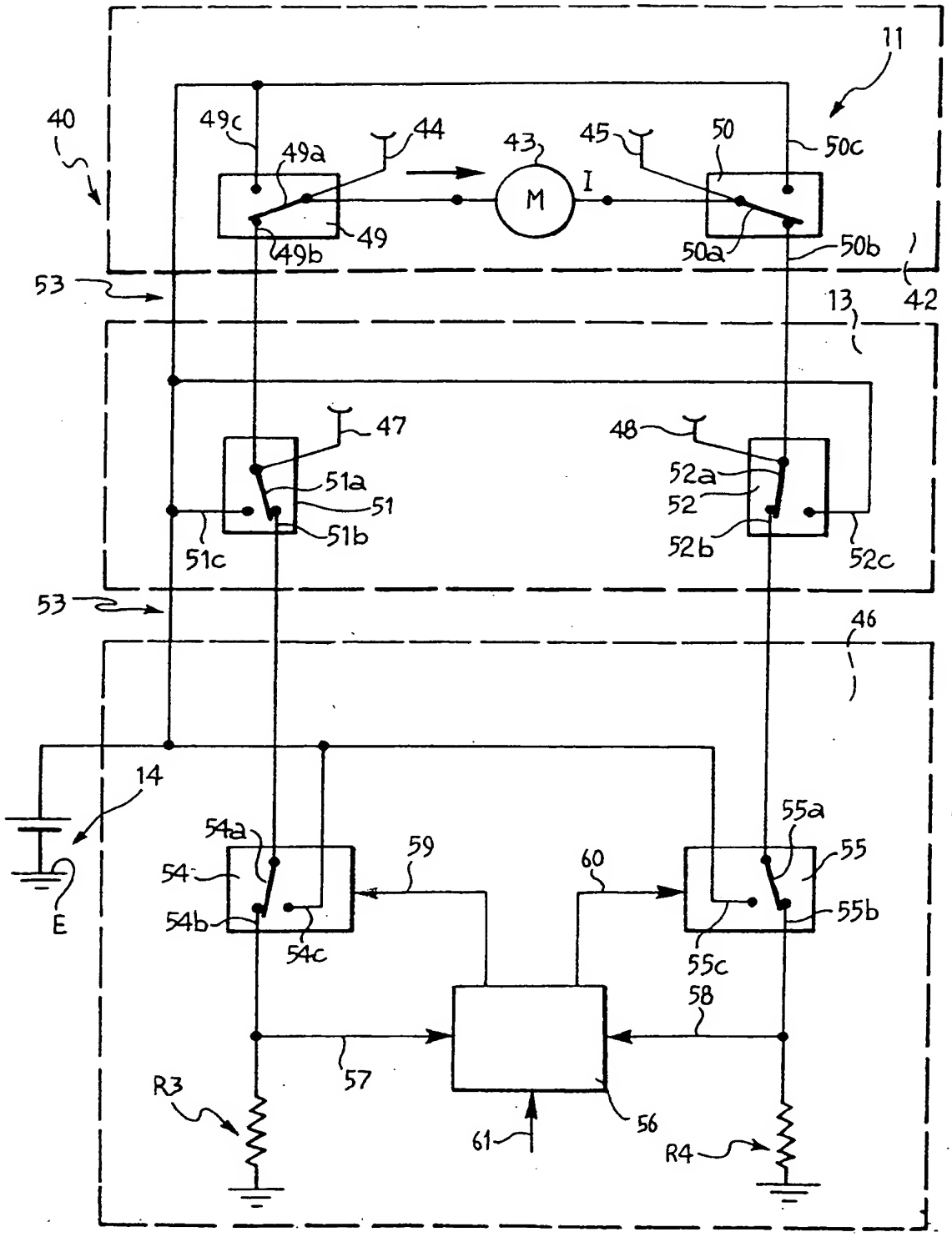


FIG. 3



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 11 8840

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X A	DE 43 24 658 A (SIEMENS AG) * the whole document *	1,4,5 2,6	E05F15/16
A	EP 0 595 452 A (SUMITOMO WIRING SYSTEMS LTD) * column 1 - column 2; figure 7 *	1-6	
A	GB 2 013 428 A (TEKRON PATENTS LTD) * abstract; figure 1 *	1-6	
A	GB 2 026 723 A (TEKRON PATENTS LTD) * abstract; figure 4 *	1-6	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

E05F
H02P

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 February 1997	Beyer, F

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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EUROPEAN PATENT OFFICE

Patent Abstracts of Japan

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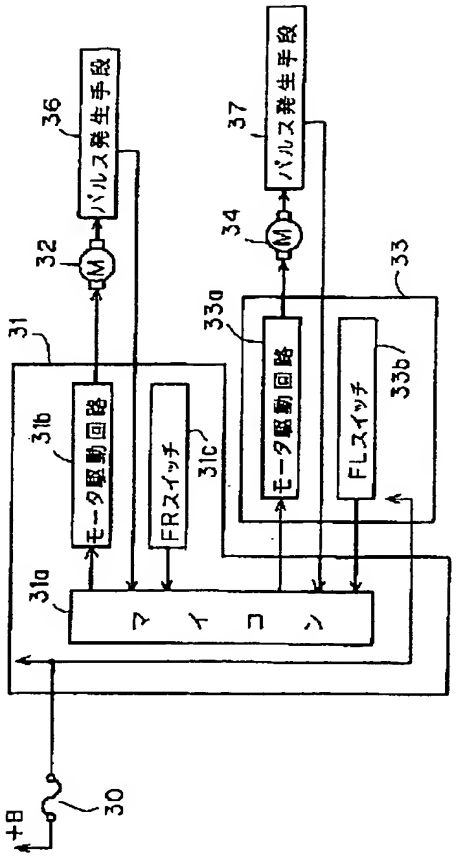
APPLICATION NUMBER : 06241597

APPLICANT : SUMITOMO WIRING SYST LTD;

INVENTOR : MITSUTA RYOICHI;

INT.CL. : E05F 15/10 B60J 1/00

TITLE : POWER WINDOW CONTROL METHOD



ABSTRACT : PURPOSE: To reduce currents flowing to power window motors by shifting the action timing of each window at the time of a motor being locked or foreign matter being inserted when the operation of plural power window switches are overlapped.

CONSTITUTION: When the rush currents of both power window motors 32, 34 are overlapped by the simultaneous operation of FR, FL switches 31c, 33b, the operation of the switch higher in the order of precedence precedes. After the end of action of the window performed by the operation of the preferred switch, the opening/closing action of the window based on the remaining switch is performed. When the lock of power windows 32, 34 is generated by the complete opening or complete closure of both windows or by the insertion of foreign matter in both windows, the lock of the power window motors 32, 34 are released in succession according to the predetermined order of precedence of the windows.